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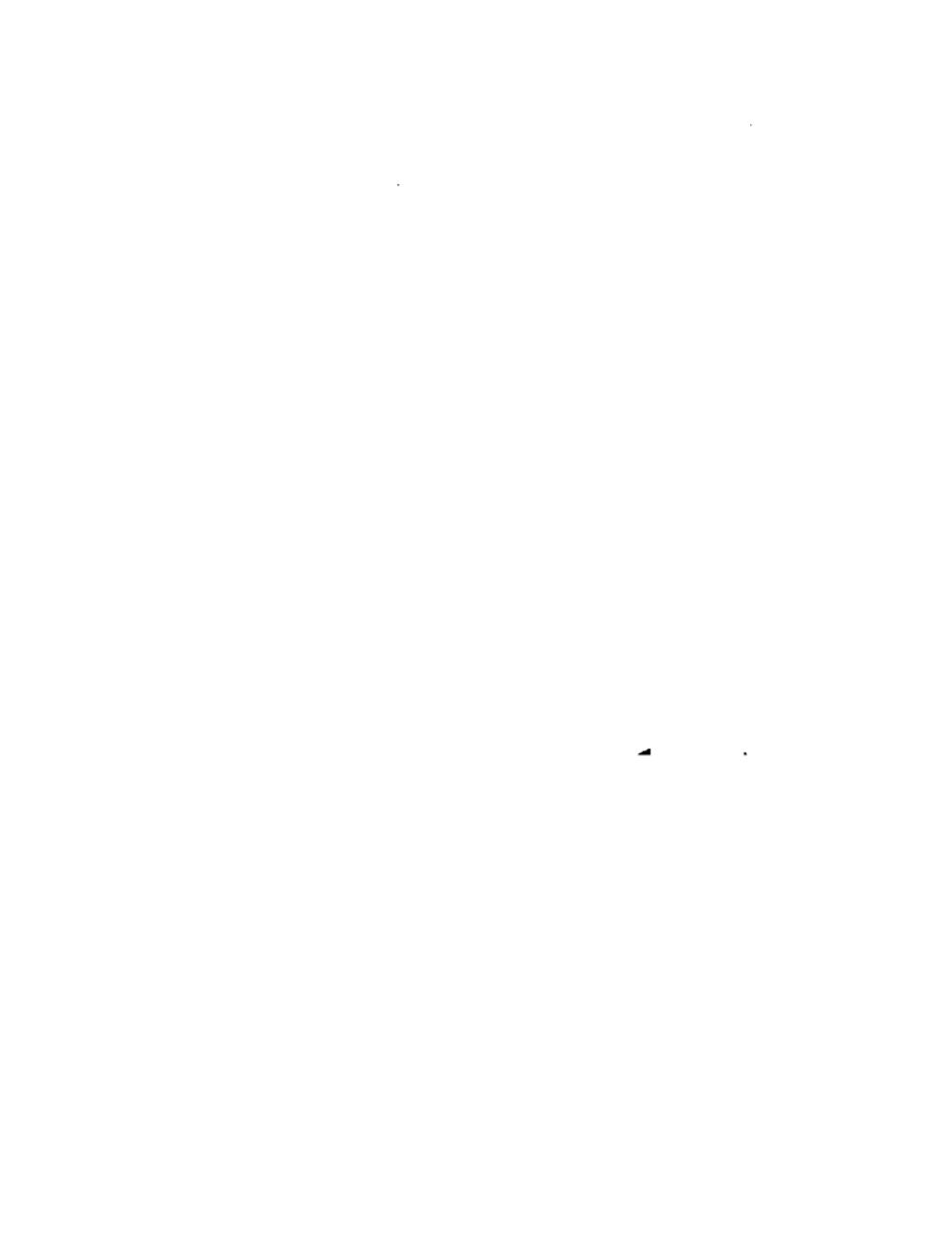
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**HANDBOOK OF  
MILITARY SIGNALING**

**PREPARED BY  
CAPTAIN ALBERT GALLUP  
SIGNAL OFFICER FIRST BRIGADE  
NATIONAL GUARD STATE OF NEW YORK**

**NEW YORK  
D. APPLETON AND COMPANY  
1893**



## N O T E .

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THIS Handbook is in many respects elementary, but it will suggest subjects for further and more extended study. The signal code and conventional signals are taken from a leaflet issued by General A. W. Greely, Chief Signal Officer U. S. A., dated July 1, 1889, and authorized by G. O. 59, A. G. O., June 28, 1889. The description of the kit and the general service battery and some of the instructions for field work are abbreviated from Myers's Signal Manual and from the Manual issued by the British War Office. The directions for the use of the heliograph are, with his kind permission, taken from those prepared by Captain R. E. Thompson, Signal Corps U. S. A., and authorized by G. O. 99, A. G. O., November 15, 1888. The plan for the establishment of a field telegraph line is taken from the report of the Chief Signal Officer for 1888 to the Secretary of War. The rules for the use of the cipher disk are taken from G. O. 12, A. G. O., February 25, 1886. The description of the outpost cable cart was prepared by Captain C. E. Kilbourne, Signal Corps U. S. A. Suggestions have been adopted, so far as they seemed to be

signaling. In order that interested with uniformity, a drill is instruction "Reg." indicates a reference to regulations. The course of instruction is the most simple and leads up to the more difficults. A signalman should bear in mind that they are primitive, and that their use is attended with many difficulties; that although the various visual signaling possess the advantage of simplicity and great mobility in establishing and advancing lines, and although the heliograph is of enormous value, it is subject to the weather. The telegraph alone, if the line is protected, is certain, rapid, safe, and secret. Even though a signalman fails to receive a sounder with facility, yet thorough instruction in erecting and taking up the flying field telegraph, in repairing breaks, and in the management of the batteries, is of the utmost consequence. The subject of erecting permanent and semipermanent lines was purposely omitted, as that work is largely mechanical, and as the recruit's time can be better occupied in other directions. The limits of this book do not permit a description of field telephone apparatus. The very successful French system of Captain Charollois is worthy of attentive study.



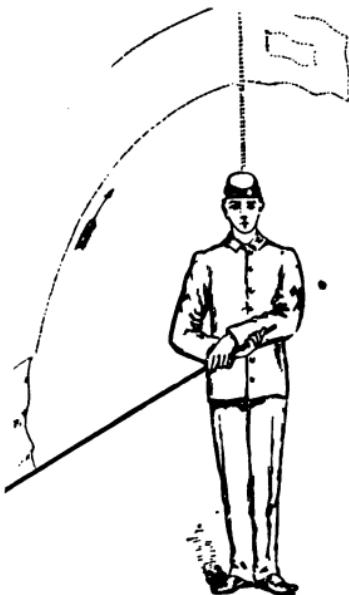


Plate 1.

will be no pause whatever between the motions required for any single letter.

A slight pause will be made between letters.

At the end of each word, abbreviation, or conventional signal the space signal, or "front" motion, is made, preceded and followed by a pause equivalent to that made between letters.

#### CONVENTIONAL SIGNALS FOR FLAG OR TORCH.

**4. To call a station.**—Signal the "call letter" of the station required, or, if the call letter be not known, signal "A"

hout pause until acknowledged. The calling station then proceed with the message.

**To acknowledge a call.**—Signal "I" three times followed by "A" and the call letter of the acknowledg-

1  
2.  
the  
and  
onal  
, ad-  
dy of  
ture ;

terw<sup>o</sup> of th<sup>r</sup>  
and in le  
difficulty  
the opp<sup>o</sup>  
“3” and  
that “1”  
and Of  
whic<sup>h</sup> com<sup>o</sup>  
of I  
in w<sup>o</sup>.

188.

lams.”

To John  
ds by e<sup>o</sup>  
body of



The Wand consists of a  
i an inch thick and fourteen inches long.  
or practice only. Habitual use of the wand in sena-  
pher messages at every drill will give the best results.  
gh tedious, it is the method by which the recruit will  
me qualified in the shortest time. The wand should be  
l loosely between the thumb and the middle of the third  
nt of the first finger, and steadied by a slight pressure  
the little finger. If grasped firmly, or with the other  
ingers, it can not be moved quickly enough. Each letter  
ould be made with the utmost rapidity, the wand being  
rought from the vertical to the horizontal at each motion  
ith a slight turn of the wrist. It is not difficult to read  
etters made in this manner, provided a sufficient pause is  
allowed between them.

11. To enable the recruit to concentrate his attention,  
he may be allowed to sit down. The instructor, standing  
a few yards from him, should make first the dot characters,  
E, I, S, H, P, 6, and repeat them in different combinations  
until they can be read. The recruit will be forced to con-  
centrate his attention upon the wand if the instructor sends  
the next letter as soon as he sees the recruit open his lips  
to call the one sent. Next the dash letters may be taught  
T, M, 5, L, and the dot and the dash letters may be com-  
bined. Next should be taught the dot and space letter  
~ v z &, and afterward those mentioned in pa-  
-izing the pairs. Recruits sh



Plate 5.

a strap, on the  
pentine is burned in the torches.

The *Haversack* contains *wicking*, a  
*vesuvius matches*, *scissors* for trimming  
wick, *pliers* for screwing the clamps,  
*nel* for filling the torches, two *flame*  
and two *extinguishers*, which are copper  
large enough to cover the ends of the te  
A *wormer* about ten inches in length  
ried inside of one of the torches when p  
with which the wick may be drawn ou  
Plate 4 (Myers) is shown this apparat  
cepting the flags.

15. The recruit is next instructed  
use of the small flag on the upper joir  
will assume the position of the soldi  
mounted, facing exactly toward the  
ing station. (Plate 5.) The staff is  
in front of the center of the body  
held with either hand at the butt, v  
at the height of the waist. Being lov  
the ground and pointing toward the  
er, the butt being in front of the be  
the end of the staff will be in a line drawn from th  
to the receiver, called the *line of vision*. (Plate 3.)



Plate 6.

the ball; the points on the middle of the pole. A movement upward indicates a dot; a movement downward indicates the ball being brought to the point of rest between each movement. The "front" is made by the ball without pause above and a little below the point of rest, instantly returning. There should be a smooth ring block or sheave at the top of the pole, and the ball hoisted or lowered by the halyards may run over a wooden wheel attached to the bottom of the pole, one revolution the wheel being sufficient to raise or lower the ball from

the point of rest to the top or bottom of the pole. A mark on the periphery of the wheel may be made to indicate when the ball is at the point of rest.

This apparatus is especially useful in armament-turret of bullet-proof sheet-iron four or five feet built to protect the operator.



Plate 8.

twenty-three m  
a glass. This  
is, however, co

The flash s  
aimed directly  
the farther fl  
should be adjus  
much care.

Electric lig  
be used on P  
stations. These  
however, be se  
as oil-lamps i  
tion to their  
candle-powers.

Although

bolic reflector saves the most light, yet a chea  
dioptric lens, such as is used for railway signal  
gives a light sufficiently powerful for short dist  
lens of this sort, about five inches in diameter, w  
cylindrical reflector, is sufficiently powerful t  
eight miles with the naked eye.

**23.** In using a lantern or any other flash, a  
graph, or any apparatus in which *time* determ

aken by the sender to ...

as in telegraphy. (Par. 80.)

The *Heliograph* is shown in Plates 9, 10, and 11: Field equipment packed (Plate 9) consists of—

A sole-leather pouch, containing:

One sun mirror.

One station mirror. { Inclosed in a wooden box.

One screen. One sighting-rod. One screw-driver.

1. A smaller pouch, sliding by two loops upon the strap of the larger, containing one mirror bar.

2. A skeleton case, containing two tripods.

The various parts are as follows, referring to the plates:

A. Screen.

B. Key for screen.

C. Sun mirror.

D. Station mirror.

E. Mirror supports.

F. Tangent screw for revolving mirror about horizontal axis.

G. Mirror bar.

H. Tangent screw with ball bearings for revolving mirror about vertical axis.

I. Clamp screw for attaching mirror bar to tripod.

K. Spring for clamping mirrors and sighting rod.

L. Sighting rod with movable disk.

" has an unsilvered spot at its center, the  
" " in other respects they are

... sighting-rod until the center of the mirror sighting-rod, and distant station are accurately then clamp the bar firmly to the tripod, taking care not to disarrange the alignment. Turn up the disk of the sighting-rod.

Move the mirror by means of the slow-motion screws until the "shadow-spot" falls upon the disk of the sighting-rod. The flash will then be visible to the observer.

*The shadow-spot must be kept in the center of the disk during signaling.*

Attach the screen to its tripod, and place it, and in front of the sighting-disk, so as to intercept the flash.

*With two mirrors* (Plate 11).—Set the tripod firmly in the ground, clamp the bar diagonally across the vision to the distant station, clamp the sun mirror to the sun, to the end of the bar with the tangent-sight attachment; and the station mirror, facing the direction of the distant station, to the other socket. Stooping down, the rear of and near the station mirror, turn the sun mirror by means of its slow-motion screws until the whole station mirror is seen reflected in the sun mirror,

its normal position when the key is released. If it fails to respond promptly, strengthen or replace.

3. Extra care bestowed on preliminary adjustment is repaid by increased brilliancy of flash. With alignment absolutely assured and the shadow-spot at the center of the disk, the axis of the cone of reflected rays is coincident with the line of sight, and the distant station receives the greatest possible intensity of light.

The distant operator is necessarily the best judge as to the flash received; if, therefore, adjustment is called when the shadow-spot is at the center of the disk, the *alignment* is at fault. Accuracy of alignment may be tested by looking into the sun mirror, bringing the eye into line with the unsilvered spot, the reflection of the disk, and the reflection of the distant station. (If not in line, the sight vane or the station mirror needs adjusting. This method of aligning is surer than the other, and this test should be also used for the preliminary adjustment. When the mirrors are turned obliquely, the unsilvered spot and the paper disk will appear oval. The centers of these ovals should be in line with the reflection of the station.) If now the position of the eye be changed, although the unsilvered spot and reflected disk will no longer cover, yet *the lines of their centers in all positions will intersect at the reflection of the station, if the alignment be true.*

4. The tendency of the shadow-spot to move off the disk, due to the apparent motion of the sun, is compensated for, without interrupting signals, by means of the tangent screws of the sun mirror. The movement imparted by these screws to the mirror does not disturb the alignment, as its center (the unsilvered spot) is at the intersection of the axes of revolution, unless the instrument is faulty (Par. 69).

a. That the images vary in brightness, the larger producing the brighter images.

It is therefore evident that the advantage derived from the use of a large mirror consists not in any increase in size of the flash, but in an increase of *brightness*—i. e. ability for overcoming such obstructions as fog, smoke and consequently distance.

8. The light from the sun is projected upon the surface of the mirror in a cone of rays, and is reflected in a cone of the same dimensions. The angle within which reflection is visible is that subtended by the diameter of the mirror. The limit of the lateral extension of the flash at any distance may therefore be definitely determined, and it has been found that *the circle of illumination has a diameter which increases sixteen and one third yards for every mile of distance from the mirror.*

As the diameter of the flash increases directly with the distance between stations, adjustment of the instrument will be quite as simple and certain for great as for short distances.

Although the margin of flash is ample, so that it may be directed upon a station however distant, without hazard, yet it is so slight relative to the distance between communicating points that signals are invisible to those who are out of the direct line, and are therefore not liable to be read by those for whom not intended.

It is evident, from the proportion between the diameter of the flash and the distance, that the instrument n

one eighth of an inch in diameter, and weighs about ninety-one pounds per mile, with sixty-four ohms of resistance to the conductor per mile.

For carrying the cable over roads, it may be suspended from trees or temporary poles by means of cord or hangers or light insulators, the cable being protected by a piece of tape or cloth.

For semi-permanent lines (on poles), No. 14 galvanized iron wire, weighing ninety pounds to the mile, is suitable up to thirty miles; coiled compactly, it can be carried in a small space.

The *Instruments* should be suitable for work on the general telegraph system of the country. They consist of pocket relays, which combine a sounder and key, and which can be carried in the breast-pocket in a case, for use in tapping a wire, or on stations where it is desirable that the click of the sounder usually employed should not be heard. For general work the *box sounding relay* wound to one hundred and fifty ohms with key, or, if not obtainable, a *sounder* wound to twenty ohms and *key* screwed closely together upon a board a few inches square, and carried in a wooden box, are convenient. A main line or pony relay should be supplied as well for each station, when there is no box relay.

The *Batteries* for an open circuit may be of the dry-cell type, as they require no attention, but their action is at times uncertain, and they must be recharged at the factory or new cells provided. They are useless with a closed circuit, as they run down quickly, and hence can not be used in connection with the ordinary telegraph lines in this country. The style of battery to be used in service should alone be used on drill.

The wet battery in its various forms is more powerful,

the jar—for a round cell, three pounds; for a five pounds—and covered with a layer one and thick of common clean sawdust or sponge. Cut the zinc; see that the fenders are in place, a jar with water to the neck of the zinc. To stirry at once, add an ounce or two of sulphat solution and short circuit. This battery need frequently as the general service cells.

The number of cells of the patterns described to operate main line wire of different kinds military use for short distances is as follows, 1 galvanized, Birmingham gauge; the copper can gauge:

Okonite cable: inside conductor composed of 30 copper wires; for one mile, fifteen cells; for a fractional mile, three cells.

For outside conductor (in case a metallic circuit composed of ten No. 80 iron wires seventy-six ohms per mile; in addition to the battery for conductor, for one mile, twenty cells; for each mile, three cells.

No. 9 iron wire (sixteen ohms), one mile each other mile, three cells. No. 12 iron wire (ohms), one mile, nine cells; each other mile,

lating fenders or fenders  
it with the zinc element.

ge the battery, sulphate of copper is placed in  
or a round cell, three pounds; for a square cell,  
s—and covered with a layer one and a half inch  
ommon clean sawdust or sponge. On this place  
see that the fenders are in place, and fill up the  
water to the neck of the zinc. To start the bat-  
tice, add an ounce or two of sulphate of zinc in  
nd short circuit. This battery needs cleaning as  
y as the general service cells.

umber of cells of the patterns described necessary  
e main line wire of different kinds suitable for  
use for short distances is as follows, the iron wire  
ed, Birmingham gauge; the copper wire, Ameri-  
ge:

ite cable: inside conductor composed of ten No.  
er wires; for one mile, fifteen cells; for each addi-  
nile, three cells.

outside conductor (in case a metallic circuit is used)  
ed of ten No. 30 iron wires seventy-six ohms resist-  
r mile; in addition to the battery for the inside  
or, for one mile, twenty cells; for each additional  
ree cells.

9 iron wire (sixteen ohms), one mile, eight cells  
—mile three cells. No. 12 iron wire (thirty-thre  
—mile. three cells.

~~call or the lookout —~~  
~~a man will confine his attention avowally,~~

#### ESTABLISHING THE STATION.—BACKGROUNDS.

While in preliminary practice the position of a station can be easily discovered, yet in the field, where stations are moving about, more care is necessary. At night fire or colored lights may be burned, the color having been determined upon beforehand to avoid confusion; or signals, Roman candles, or rockets may be discontinued in accordance with a predetermined understanding. A *fixed* station is one already established, and by a *moving* station is meant that a party has gone in a certain direction to open a station. Moving stations must always be prominently placed as possible, as on hill-tops, or in the center of open fields, or near marked houses, or near a building which is likely to attract attention from the other stations. In a forest, an open field should be selected if high ground is thence visible, unless a high tree is available.

Those in charge of fixed stations should habitually, without orders, examine all prominent points with a telescope and distance to see if communication is attempted. During the day time a moving station may indicate its position by a puff of smoke made by firing powder upon the ground, or a steady smoke by setting large armfuls of lighted

o, then rise and see that the farther station is visible or rise. If this precaution is taken on each side of the station, the farther station can see the flag at all times. Move along the line of vision in front of the station and examine its position from that line. If the station is higher, the background will be the color of the landscape behind and lower than the flagman; if lower, the background will be the color of the landscape lying higher than the flagman. If the stations are of equal elevation, the background will be that of the ground behind the flagman. The background may be a distance, sometimes miles, behind the sending station though the station is on an eminence, it is possible that there are higher grounds behind it. In the landscape backgrounds the white flags should be used; sky exposure backgrounds are not often found at heights on land, except on the exact crest of ridges and mountains. As a rule, always use the light flag until the color of the background is determined. Having decided, the white flag must be used with green or earth-colored backgrounds; with a sky exposure background flag; with broken or mixed backgrounds, the flag. When communication is opened the stations can determine what colored flag can best be seen. The favorable conditions for flag signaling are a clear sky, a

tion by signals is of no value if mistakes occur. Patience, strict attention to small details, and deliberation, are of vital importance, and a little haste or carelessness may cause long delays. Rapidity should always be sacrificed to absolute certainty. Nothing must be taken for granted, and repetitions should be called for in case of the slightest doubt.

**50.** In case of an emergency, a flash may be improvised by moving a hat in front of a lantern; by lowering and raising a lantern behind a screen or in a bucket; by flashing a fire with a blanket, as explained above (Par. 43). In the daytime, at a distance, having no flag large enough, a man, either mounted or on foot, can open communication by walking to the right and left of a prominent rock or tree; thus, standing in front of the tree, he marches to the right twenty or thirty yards, then returns to the tree and passes to the left of it the same distance and back. He thus writes dot and dash, or "A." Marching to the front toward the other station and back, he makes the space. A man on horseback should be visible many miles. A skillful telegraph operator can read by placing the two ends of a conductor against his tongue. In case of an extensive break in a wire, messages may be sent across it by establishing several sending and receiving stations in line.

**51.** Every message may be commenced with a period, to assure the receiver that nothing has been missed by him. The four-foot flag should be habitually used, unless the distance is so great that the six-foot flag is necessary. Whenever signals cease for a time, the sending station, providing it does not intend to close, should keep the flag flying or the foot torch lighted, to indicate to the other station that a message may be expected at any moment.

**52.** In case a relay station (as Station "A") is busy with a message, and if for lack of men or any other reason

message being transmitted, then call up the station ("B") that when its call is acknowledged should send "front," which should then be acknowledged. In case of interruption of the message in course of transmission may be interrupted by breaking and sending "1" ("Wait a moment") followed by the call of the other station ("B") then acknowledged. Then the interrupted message is continued. In every case a station calling must be acknowledged as soon as observed.

Non-commissioned officers or privates in charge should receive thorough and unmistakable written orders, which should be literally carried out, unless circumstances arise which require them to use their own discretion; but any independent action on their part should be reported as soon as possible.

A transmitting or relay station should be in charge of a commissioned officer. A terminal station should be in charge of a corporal; and a branch station, in charge of a sergeant. No party should change position without informing all other stations in communication with it of its intention to do so, and should indicate the compass direction in which it proposes to move. It should be posted as near as possible to roads convenient of access.

Advancing upon a re-

coat, shelter-tent, or rubber blanket, and other equipment, are packed as prescribed in regulations (Pars. 269-271). The most reliable squad should be intrusted with the care of, inclosed in a sole-leather case and slung upon its pommel. The non-commissioned officer should alone be intrusted with the care of the helmet over his shoulder. A spare canteen may hold enough kerosene for the lantern to last nights. The army campaign hat, cavalry boots (or grain-leather boots, laced on the instep), and a stable frock, with flaps to button the sleeve and the wrists, to wear among underbrush, will beiceable for rough work in the field. Some space in the sleeves of the overcoat around the wrist and hand, will promote comfort.

#### MANUAL OF THE KIT AND INSPECTION.

##### *Position of Order Kits.*

**60.** THE recruit is in the position of the soldier of the kit resting on the ground, arms hanging by, elbows near the body, the right hand holding easily between the thumb and fingers.

noise, the ferrule or the tip by the left foot; take out the torches, attach the flame shades, place them on the ground in front of the open kit, the foot torch on the right, the flying torch on the left with the clamps exposed, place the extinguishers close to and between the flame shades, the pliers, wormer, scissors, and funnel from right to left between the extinguishers; fold the flags neatly in three thicknesses, so that the folds are parallel with the edge upon which the tiers are sewed, and lay down the flags in pairs on the kit cover, the white flags underneath, the dark flags on top, according to their size, the largest flags at the bottom, so that the tiers on each flag will be exposed; raise the staff with the left hand, place the butt by the side of the left toe, the left hand at the height of the breast, dress to the right without command and stand at attention faced to the front.

65. Before the inspection, intervals of two paces may be taken to the right or left, or distances may be taken to the front (Reg. Pars. 177 and 179).

66. After the inspection is concluded at the command 1. *Reread*, 2. **KITS**. The kits are repacked, the canteen and haversack slung, the position order kits resume and the line dressed. Intervals or distances are closed (Reg. Pars. 178 and 179), the kits being slightly raised from the ground during the movement.

67. The inspection of kits may be preceded or followed by inspection of arms and general appearance (Reg. Pars. 1088-1091). Kits may be carried for inspection by the odd numbered men, and opened and repacked with the assistance of the even numbered men, or in quarters may be opened and their contents displayed and inspected without the presence of the men, the staff being jointed and laid parallel and close to the line of kits.

68. At inspection of kits it should be observed that



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